On the previous page we find his opinion of his own exploit, for he there tells us: "This calculation is, perhaps, the most rigid geometrical investigation that has ever been applied to an astronomical problem."

Perhaps our readers will scarcely credit the statement that, notwithstanding this proud confident boasting, there is no *investigation* at all. All the author does is to draw a circle, which of course he can draw through three points, which are different positions of the earth's pole, and then, because his circle always passes within one second of the different positions of the pole for a couple of hundred years, we are asked to take it as proved that the pole always has been and always must be on this circle.

The extreme proximity of two curves for a comparatively short distance is no criterion of their being coincident.

The author, in the preface to this work, makes some strictures on our remarks on "The Glacial Epoch." In these he mistakes our illustrations for arguments, misquotes our objections, and misstates our arguments. It is impossible to reply, and it is perhaps as well; we have already given too much space to this author.

OUR BOOK SHELF

Degli Studi Fisici di Ambrogio Fusinieri: Commemorazione per Enrico dal Pozzo di Mombello, Professore di Fisica nell' Università Libera di Perugia. (Foligno, 1874.)

THIS dry little book gives an account of the works of Fusinieri which related chiefly to endosmose, capillarity, adhesion, and other molecular actions; also to static electricity and to magnetism. He published a work in 1844 on "Molecular Mechanics, and a Repulsive Force in the Ethereal Medium," which we have never seen, but which would surely be of interest now in connection with Mr. Crookes's experiments on repulsion by heat in a vacuum; in 1846, a memoir on Light, Heat, Electricity, Magnetism, and Electro-magnetism; in the following year a memoir on Meteorology; and altogether many small occasional memoirs. The second part of Prof. dal Pozzo's works is a critical inquiry into the work entitled "The Unity of the Physical Forces," published in 1864 in Rome by Father Secchi; and the third part contains some biographical notices of Fusinieri. The book is unillustrated, and has no felicities of style to recommend it; the students of the Free University of Perugia must be devoted scientists if they purchase the book and manage to read from beginning to end of it.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Royal Agricultural Society and the Potato Disease

THE paragraph which appeared in your last week's issue is so far interesting that it amply confirms the expectations of those who have watched the well-meant efforts of the Royal Agricultural Society with respect to the potato disease. I wish to advert to it for two reasons. In the first place, it is interesting to see the way in which a matter of this kind is regarded by so influential a body. Here is a disease annually effecting the destruction of a larger or smaller part of a chief item in the food of the community, which has already produced a famine in one of the three kingdoms, and any year may produce another, and which for the last thirty years has seriously occupied the attention of scientific men throughout Europe. Is it not surprising that the Royal Agricultural Society should think the offer of a 100*l.* prize for an essay in any way an adequate method of dealing with the subject? In the first instance, the time for sending in the essays was actually fixed so as to prevent the competitors from even going over the life history of the fungus during one season before competing. This was pointed out, and the time was prolonged. But though the competition was advertised abroad in the German papers, nothing of any importance was elicited beyond what was already well known.

The Society then determined to offer prizes for disease-proof potatoes. The utter futility of this proceeding was clearly obvious to anyone in the least acquainted with the subject. But it was done, and possibly if the "botanic referee" liked travelling about the three kingdoms, his time was not wasted. But the result is exactly what it was predicted it would be.

Now, it seems to me that this spasmodic and ill-considered way of dealing with a serious subject contrasts, to an extent that it is impossible quite to regard with satisfaction, with the course that would be adopted in such a matter in other countries. It shows, at any rate, how little the methodical scientific method of investigation is understood by the majority of well-informed English people.

And this brings me to my second point. The Society, anxious not to be entirely foiled, offered a sum of money to a well-known investigator of the life history of fungi, Prof. de Bary, of Strasburg, to induce him to study the potato disease. Considering that De Bary had already written an admirable memoir on the *Peronosporæ*, there was a certain simplicity in supposing that the gift of a sum of money would elicit some additional information which his zeal as a scientific investigator had failed to do. If it does, however (and the history of the *Peronospora infestans* is not perfectly understood), it will be a clear gain; but when we are told that "Prof. de Bary has worked out the scientific questions that occur as to the origin of the disease," and that "it is owing to a fungus (*Peronospora infestans*) which attacks the leaves first, and after absorbing the nutriment of them, utilises the petiole, and thus reaches the tubes" (*sic*), it is necessary to point out that all this and a good deal more was ascertained by the Rev. M. J. Berkeley in this country, and by Montagne in France, and published by the former in a paper contributed to the first volume of the Journal of the Horticultural Society in 1846.

Nov. 20 W. T. THISELTON DYER

Zoological Gardens, Regent's Park

HAVING lately visited some of the Zoological Gardens on the Continent, and on my return compared those in the Regent's Park with the recollection of the former, I have been impressed that the latter appear to stand in need of much improvement.

In the first place, to adapt them to modern ideas of sanitary science, we should consider they are much *too small in area* for the number of inhabitants, especially as several of these are of gigantic size, and many others need naturally much space for exercise.

The *carnivora*, when bred and reared in dens of too small extent, begin to lose their muscular fulness of body, and what muscle remains becomes degenerated, and some members of their litters, reared in captivity, get affected with symptoms of paraplegia, with weakness in the buttocks and posterior limbs.

Proprietors of travelling menageries are in the habit of putting their carnivora and large animals through a series of *gymnastic performances*, which will be doubtless of as great benefit to their health as they are to the human species, and ought therefore to be introduced into our Zoological Gardens.

The *antelope and deer tribes*, being of nomadic disposition, should have much more space allotted to them than there is at present in the Gardens, where should be provided means for grazing and browsing in the open air, in full sunlight, and with free exposure to the winds, to ensure healthy digestion and complete aeration in the lungs.

In a city so well provided with water as London is, one must be surprised at the *scantiness of the supplies* afforded to some quadrupeds and birds, whereby what little exists very soon gets soiled and unfit for bathing and drinking purposes. These basins and ponds are seldom to be seen filled with aught else than ditch water, and are as dirty as horse ponds, whereas there might easily be designed and constructed a plan for a constant supply of fresh water to run in, and the foul water out, and thus ensure purity and cleanliness.

The casual visitor must also enter a protest against the unclean state of the cages of the *Raptorial Birds*, which are splashed all over with ordure, offensive to the sightseer in appearance and smell, and injurious to the health and plumage of the birds themselves.

The *drainage* of the Zoological Gardens is also so defective as to be verging on a public nuisance to the inhabitants of the banks of the Regent's Canal, so that some means must soon be taken for the better disposal of the sewage.

If facilities do not exist for extending the area of the Regent's Park Gardens, from want of power to acquire more ground, then it should become a serious question whether or not a supplementary Garden might be obtained in the suburbs further off. It could scarcely be expected that the subscribers would relinquish the retention of the present position, on account of its advantageous situation in the town for the access of visitors. It is quite possible visitors might be satisfied with much *fewer animals to see*, especially of those unattractive in appearance and habits, and it could easily be decreed that all these might be sent to another garden for scientific purposes alone.

Further, the *second garden* might be appropriated for breeding purposes, and change of air and locality for the usual inhabitants of the old enclosures and dens and cages, when the latter were required to be repaired or disinfected; and finally, it might be used as a *sanatorium* for the sick, and an asylum for the decrepid and disabled members of the stock, when their further exhibition in public is no longer desirable.

The great prevalence of *tubercular and scrofulous diseases* reported to exist amongst the animals should also be cited as indicative of a necessity for increased space and ventilation being required in the gardens, and it is much to be desired that some *statistics* of this class of disorders should be compiled and published for general information, giving details of its greater or less frequency in special classes of quadrupeds, birds, reptiles, and fishes.

VIATOR

IT has often occurred to me that the officers in charge of our Zoological Gardens enjoy exceptional opportunities of ascertaining experimentally the limits of the intellectual and educational capabilities of the animals under their charge, but I am not aware of the existence of any systematic effort to realise the harvest of valuable and interesting information that lies here waiting to be gathered. Is not this an object worthy of the attention of the Zoological Society?

Nov. 17 C. TRAILL

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*NOTE ON THE DEVELOPMENT OF THE COLUMELLA AURIS IN THE AMPHIBIA**

IN his paper "On the Structure and Development of the Skull of the Common Frog" (Phil. Trans. 1871), Mr. Parker states that, in the fourth stage of the tadpole,† "the hyoid arch has made its second great morphological change; it has coalesced with the mandibular pier in front and with the auditory capsule above (Plate V. Figs. 1—4, and Plate VI. Fig. 8, *s.h.m.*, *i.h.m.*) The upper part, or supra-hyomandibular (*s.h.m.*), is attached to the auditory sac much lower down and more outward than the top of the arch in front. . . . This upper distinct part is small; it answers to only the upper part of the Teleostean hyomandibular; there is a broad sub-bifid upper head answering to the two ichthyic condyles, then a narrow neck, and then behind and below an 'opercular process' (*op.p.*) Below this the two arches are fused together; but the hyoid part is demonstrated just above the commencement of the lower third, by the lunate fossa for the 'styloid condyle' (Plate V. Figs. 2 and 4, *st.h.*)" (pp. 154, 155).

In the sixth stage:—"The supra-hyomandibular (Fig. 3, *s.hm.*) has become a free plate of cartilage of a trifoliate form" (p. 164).

In the seventh stage:—"The 'supra-hyomandibular' losing all relation to the hyoid arch, becomes now part of the middle ear. . . . The *essential* element of the middle ear, the stapes (*st.*), was seen in the fourth stage; the condyles and opercular process of the hyomandibular are now being prepared to form an osseo-cartilaginous chain from the 'membrana tympani' to the stapes. Under these conditions a new nomenclature will be required; and this will be made to depend upon the *stapedial* relationship of the chain, notwithstanding its different morphological origin.

"I shall now call the lobes of this trifoliate plate of cartilage as follows—namely, the antero-superior 'supra-stapedial,' the postero-superior 'medio-stapedial,' and the freed opercular process 'extra-stapedial' (*s.st.*, *m.st.*, *e.st.*)

"The stapes (*st.*) sends no *stalk* forwards to meet the new elements, but they grow towards it; this will be seen in the next stage" (pp. 169, 170).

As the question of the origin of the *columella auris* in the *Vertebrata* is one of considerable morphological importance, I have devoted a good deal of time, during the past summer, to the investigation of the development of this structure in the frog, and it is perhaps some evidence of the difficulty of the inquiry, that my conclusions do not accord with those enunciated by Mr. Parker, in the very excellent and laborious memoir which I have cited.

I find, in the first place, that there is no coalescence of the mandibular with the hyoidean arch, the latter merely becoming articulated with the former.

Secondly, Mr. Parker's "supra-hyomandibular" is simply an outgrowth of the mandibular arch from that elbow or angle which it makes, when the pedicle by which it is attached to the trabecula passes into the downwardly and forwardly inclined suspensorial portion of the arch. This outgrowth attaches itself to the periotic capsule, and, coalescing with it, becomes the *otic process*, or "superior crus of the suspensorium" of the adult frog.

The hyoid arch, seen in the fourth stage, elongates, and its proximal end attaches itself to the periotic capsule, in front of the fenestra ovalis and close to the pedicle of the suspensorium, which position it retains throughout life.

The *columella auris* arises as an outgrowth of a cartilaginous nodule, which appears at the anterior and superior part of the fenestra ovalis, in front of and above the stapes, but in immediate contact with it. It is to be found in frogs and toads which have just lost their tails, in which the gape does not extend further back than the posterior margin of the eye, and which have no tympanic cavity, as a short and slender rod which projects but very slightly beyond the level of the stapes, its free end being continued into fibrous tissue, which runs towards the suspensorium, beneath the portio dura, and represents the suspensorio-stapedial ligament of the *Urodela*.

This rod elongates, and its anterior or free end is carried outwards, in proportion as the tympano-eustachian passage is developed. At the same time, the free end becomes elongated at right angles to the direction of the rod, and gives rise to the "extra-stapedial" portion, which is imbedded in the membrana tympani. Ossification takes place around the periphery of the middle of the rod; thus the medio-stapedial is produced. The inner portion becomes the rounded, or pestle-shaped, supra-stapedial, but retains its primitive place and connections, whence we find it in the adult articulated in a fossa in that part of the periotic capsule which forms the front boundary of the fenestra ovalis, but in close contact with the stapes.

The *columella auris* of the frog, therefore, is certainly not formed by the metamorphosis of any part of either the mandibular or the hyoidean arches, such as they exist in the fourth stage of larval development.

It may be said further, that the *columella* undoubtedly *seems* to be developed from the side walls of the auditory capsule in the same way as the stapes, and some appearances have led me to suspect that it is originally in continuity with the stapes, but I am not quite sure that such is the case. Are we to conclude, therefore, that the colu-

* Read at the meeting of the British Association at Belfast, August 25, 1874, by Prof. T. H. Huxley, F.R.S.

† That is, when there is a branchial aperture only on the left side, and the hind limbs are rudimentary or very small.